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Poster · July 2018

DOI: 10.13140/RG.2.2.35327.92320

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Mapping of urban structures based on very high resolution satellite imagery for the city of DaNang, Vietnam

Andreas Braun, Gebhard Warth, Felix Bachofer

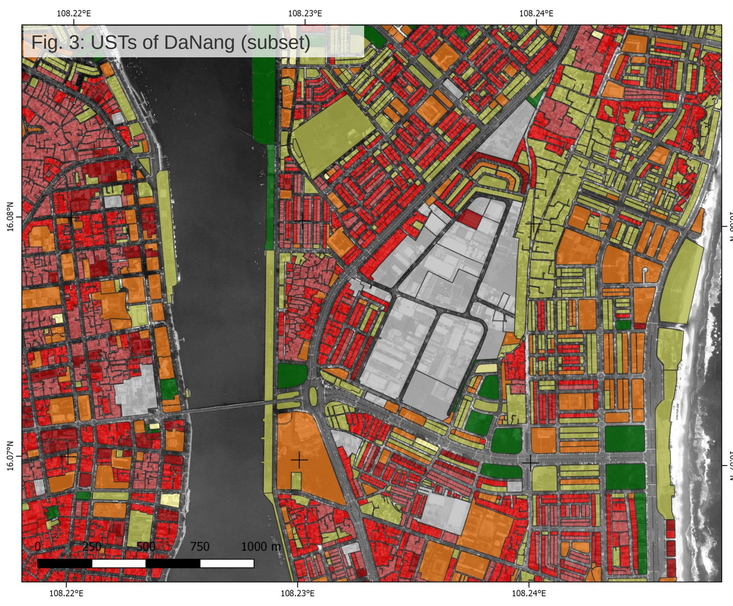
Challenges

- Many cities in developing and newly industrializing countries are **lacking base data** for their urban planning
- Existing building structure in DaNang is **extremely dense and diverse** regarding the shapes and materials of the houses
- Approximately 80% of the city consist of **narrow shop houses** (Fig. 1) of mixed use which are hard to detect in satellite images
- **Speed of urbanization** exceeds the capactity to update digital maps and plans

Fig. 1: Local-type shophouses in DaNang (© Felix Bachofer)

Fig. 2: Buildings in Hải Châu District (Pléiades imagery, reApproach: 0.5 m)

Fig. 3: USTs of DaNang (subset)



Urban Structure Types

Classification system
- compact large
- compact mid-size
- compact small
- open large
- open mid-size
- open small
- industry
- rural
- unbuilt

Approach 1

Classification of urban structures

- In a first step, **built-up areas** were identified using an object-based image analysis (OBIA) approach
- At the building block level, **urban structure types** (USTs) have been derived according to size, density and composition of buildings in a block
- **Classification** was based on density and distance measures, spatial relations, radiometric information, as well as on building heights (see Approach 3)

Approach 2

Identification of building types

- Identification of **single buildings** was partly managed by intersecting the built-up areas with cadastral boundaries
- Because cadastral data were available only for parts of the city, **manual idenfication** of buildings was conducted
- **Classification** of building types was then achieved based on building attributes, such as height, colour and UST
- Outside the VHR scene, RapidEye data were used for the assessment of **rural** buildings in the hinterlands of the city

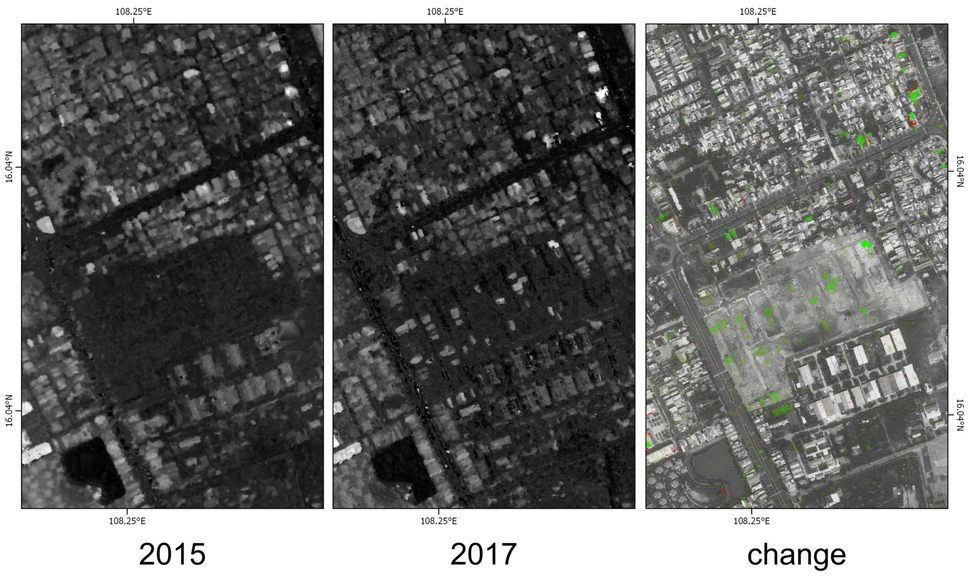


Fig. 5: Elevation-based change detection between 2015 and 2017 (subset)

Approach 3

Elevation-based change detection

- Derivation of a **digital surface model** based on the tri-stereoscopic Pléiades imagery
- Identification of areas representing ground-level elevation by **masking** built-up areas and vegetation
- Interpolation of a **ground-level elevation** model and derivation of **absolute heights** of built-up structures
- **Change detection** between 2015 and 2017 by elevation differences and radiometric changes (Fig. 5)

References and resulting publications:

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This work was funded by the German Ministry of Research and Education (BMBF, *FKZ* 01LG1301K) within the project RapidPlanning.

SPONSORED BY THE
Federal Ministry of Education and Research

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